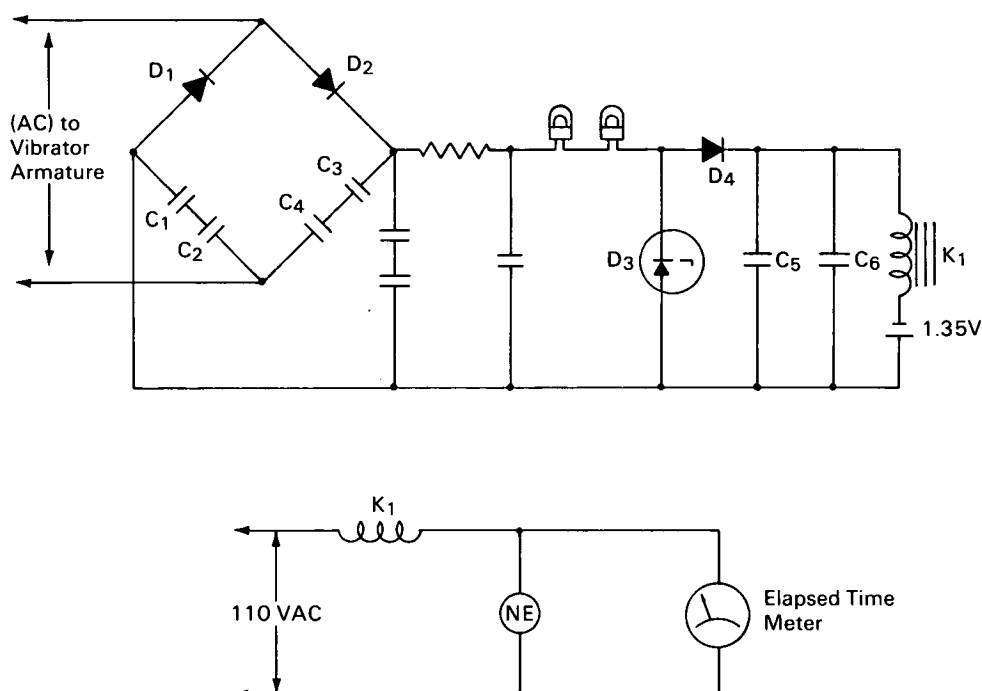


# NASA TECH BRIEF



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## Vibrator Elapsed Time Is Automatically Controlled



### The problem:

It was desired to determine elapsed operating time for vibrators (shaker tables) when three vibrators were located in one room and were powered by two amplifiers through either of two control systems. Additionally, two of the three vibrators could be operated in tandem from one or two control systems driving both amplifiers simultaneously. The problem could not be resolved by actuation of relays based on energizing the vibrator fields and amplifier plate circuits.

### The solution:

A circuit that operates the control system elapsed time clocks only when voltage is applied to the vibrator armatures.

### How it's done:

AC voltage is fed to the voltage doubler circuit consisting of  $D_1$ ,  $D_2$ ,  $C_1$ ,  $C_2$ ,  $C_3$ , and  $C_4$ . This circuit, plus the Pi filter system following it, produces a dc voltage proportional to the ac voltage across the vibrator armature. The two light bulbs act as inexpensive nonlinear resistors, having negligible resistance

(continued overleaf)

at low input voltages and approximately 8K ohms at 220 volts. Since  $K_1$  requires 1 ma dc current at 10 v for operation, voltage across it is limited to 15 v with  $D_3$  acting as the limiter. The two light bulbs protect  $D_3$  and the balance of the circuit.

The  $K_1$  relay springs are adjusted so that 3 v rms will operate it. The 1.35 v mercury cell is used as a bias to increase  $K_1$  sensitivity. The circuit consisting of  $D_4$ ,  $C_5$ , and  $C_6$  increases the shutoff time constant of the relay in order to hold it "on" during low voltage conditions due to resonances, but does not affect pull-in time which is essentially instantaneous with application of ac voltage to the doubler circuit. There is one clock (elapsed time meter) with a neon indicator lamp for each vibrator.

**Notes:**

1. The system operates only when the vibrator operates, requires no accessory power supplies, and does not affect the vibrator or its data acquisition systems.

2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama 35812  
Reference: B67-10284

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Category 01

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